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(54) Air-cooled internal combustion engine

(57) To improve air-cooling effect in a cooling air passage, and to provide an ignition plug at such position that enable easy mounting and dismounting while enabling the effective air-cooling thereof.

In an air-cooled internal combustion engine including a valve gear mechanism provided above a combustion chamber, and a cooling air passage extending in the fore-and-aft direction between the aforementioned combustion chamber and the aforementioned valve gear mechanism along an exhaust port and an intake port, there are provided a laterally extending cooling air passage in communication with the aforementioned cooling air passage extending in the fore-and-aft direction (F) between the aforementioned exhaust port (7) and the intake port (9), an ignition plug provided in the laterally extending cooling air passage, and a cooling fin (37, 38, 39) curved from the aforementioned cooling air passage extending in the fore-and-aft direction (32) toward the aforementioned laterally extending cooling air passage (35). Furthermore, a centerline of the aforementioned exhaust port is inclined with respect to the fore-and-aft direction of an internal combustion engine so as to broaden the front opening of the aforementioned cooling air passage extending in the fore-and-aft direction.

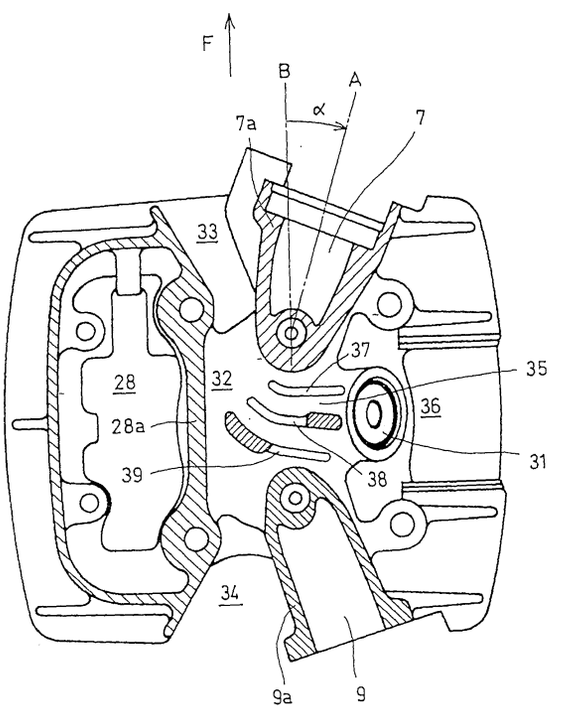

FIG. 3

EP 1 403 496 A1

Description

Technical Field of the Invention

[0001] The present invention relates to a cooling air passage for an air-cooled internal combustion engine mounted on a motorcycle and the like.

Description of the Related Art

[0002] There is an air-cooled internal combustion engine in the related art having the following structure. In this internal combustion engine includes two exhaust ports and two exhaust valves corresponding thereto disposed side by side at the front portion of a cylinder head, and two intake ports and two intake valves corresponding thereto disposed also side by side at the rear portion thereof, an ignition plug disposed at the position surrounded by the aforementioned four valves, a laterally oriented camshaft disposed between a cylinder head and a cylinder head cover, a cooling air passage passing between the two exhaust valves and between the two intake valves, and then through the cylinder head in the fore-and-aft direction, and a laterally extending cooling air passage in communication with the aforementioned cooling air passage extending in the fore-and-aft direction (for example, see Patent Document 1). In this example, an ignition plug mounting hole surrounding the body of the ignition plug with a clearance left therebetween is formed on the cylinder head, and the ignition plug mounting hole communicates with the aforementioned cooling air passage extending in the fore-and-aft direction.

When a motorcycle travels with the internal combustion engine mounted thereon, air is flown from a front opening of the cooling air passage extending in the fore-and-aft direction. Then part of incoming air is flown out upwardly of the internal combustion engine from the aforementioned ignition plug mounting hole, another part of air is flown out toward the side of the internal combustion engine from the laterally extending cooling air passage, and remaining part of air is flown out rearward from a rear opening of the cooling air passage extending in the fore-an-aft direction. In the process of such airflow, the cylinder head and the ignition plug is cooled.

[0003] JP-B-43050 (Fig.2, Fig. 3) is related to that prior art.

Problems to be solved by the Invention

In the related art, the effect of air-cooling in the cooling air passage is not sufficient. In addition, mounting and dismounting of the ignition plug is not easy. The present invention is intended to improve air-cooling effect in the cooling air passage, to provide the ignition plug at such position that enables easy mounting and dismounting while enabling the effective air-cooling thereof.

Means for Solving the Problems and Advantages

[0004] The present invention contributes to solve the aforementioned problems, and the invention according to Claim 1 is, in the air-cooled internal combustion engine including a valve gear mechanism provided above a combustion chamber, and the cooling air passage extending in the fore-and-aft direction between the aforementioned combustion chamber and the aforementioned valve gear mechanism along the exhaust port and the intake port, there are provided the laterally extending cooling air passage in communication with the aforementioned cooling air passage extending in the fore-and-aft direction, the ignition plug provided in the laterally extending cooling air passage, and a cooling fin curved from the aforementioned cooling air passage extending in the fore-and-aft direction toward the aforementioned laterally extending cooling air passage.

[0005] Since the present invention is constructed as described above and the cooling fin is provided in the cooling air passage above the combustion chamber, the portion around the combustion chamber may be effectively cooled. Since the ignition plug is provided in the laterally extending cooling air passage, and the cooling fin is curved so as to guide a cooling air toward the ignition plug, overheating of the ignition plug may be prevented.

[0006] The invention according to Claim 2 is an air-cooled internal combustion engine as set forth in Claim 1, characterized in that the centreline of the aforementioned exhaust port is inclined with respect to the fore-and-aft direction of he internal combustion engine so as to broaden the front opening of the aforementioned cooling air passage extending in the fore-and-aft direction.

[0007] In this arrangement of the present invention, since an opening area of the front opening is increased, and thus a large quantity of air may be introduced into the cooling air passage, the air-cooling effect utilizing against wind generating by travel may be improved.

Brief Description of the Drawings

[0008] The invention is now described with the following figures:

Fig. 1 is a vertical cross sectional view of a principal portion of an air-cooled internal combustion engine according to one embodiment of the present invention.

Fig 2 is a lateral cross section of a principle portion of the aforementioned internal combustion engine.

Fig. 3 is a cross sectional view showing a horizontal cross section (taken along the line III-III in Fig. 2) of the cylinder head of the aforementioned internal combustion chamber.

Fig. 4 is a perspective view of the cooling fins when viewed from the rear obliquely upside.

Mode for Carrying Out the Invention

[0009] Fig. 1 is a vertical cross sectional view of a principal portion of an air-cooled internal combustion engine 1 according to one embodiment of he present invention, showing the upper portion of an OHC (overhead camshaft) single cylinder internal combustion engine. In the figure, an arrow F represents the front. In the figure, an outer shell of the principal portion of an internal combustion engine 1 includes a cylinder block 2, a cylinder head 3, and a cylinder head cover 4. A piston 5 moved upward and downward in the cylinder block 2. A combustion chamber 6 is formed on the bottom face side of the cylinder head 3. The cylinder head 3 is formed with an exhaust port 7 and an intake port 9 communicating with the combustion chamber 6. The exhaust port 7 is provided with an exhaust valve 8 at the inner end thereof for opening and closing the port. An exhaust pipe, not shown, is continuing form the outer end at the exhaust port 7. The intake port 9 is provided with an intake valve 10 at his inner end thereof for opening and closing the port. A carburettor, not shown, is connected to the outer end of he intake port 9.

[0010] The exhaust valve 8 is provided so that a shaft portion 8a thereof is inclined forwardly of the cylinder head 3, and a valve spring 11 for urging the exhaust valve 8 in the direction to close the exhaust valve 8 is attached on the upper projection of the shaft portion 8a. The intake valve 10 is provided so that a shaft portion 10a thereof inclines rearward of the cylinder head 3, and a valve spring 12 for urging the intake valve 10 in the direction of closing is attached on the upper projection of the shaft portion 10a.

[0011] A valve gear chamber 13 is formed by the cylinder head 3 and the cylinder head cover 4, and a valve gear mechanism for opening and closing the aforementioned exhaust valve 8 and the intake valve 10 are stored therein. A camshaft 14, which extends laterally so as to be orthogonal to the fore-and-aft direction of the internal combustion engine 1, is rotatably supported between the mating surfaces of the cylinder head 3 and the cylinder head cover 4. An exhaust cam 15 for opening and closing the exhaust valve 8 and an intake cam 16 for opening and closing the intake valve 10 are formed on the camshaft 14.

[0012] A exhaust rocker arm 17 is pivotably supported above the exhaust valve 8 by a rocker exhaust arm shaft 18. One end thereof is in contact with the upper end of the shaft portion 8a of the exhaust valve via a tappet 19, and the other end thereof is in contact with the exhaust cam 15 via an exhaust roller 21 supported by a roller shaft 20. An intake rocker arm 22 is pivotably supported by an intake rocker arm shaft 23 above the intake valve 10. One end thereof is in contact with the upper end of the shaft portion 10a of the intake valve via a tappet 24, and the other end is in contact with an intake cam 16 via an intake roller 26 supported by a roller shaft 25.

[0013] Fig. 2 is a lateral cross section of a principle portion of the aforementioned internal combustion engine 1. In the figure, the cylinder head 3 is attached with an ignition plug 27 on the right side thereof, and an electrode 27a at the distal end thereof projects into the combustion chamber 6. One end of the camshaft 14 projects. into a chain chamber 28, on which a driven sprocket 29 is secured. A drive sprocket (not shown) is secured on the crankshaft and a cam chain 30 is put around the aforementioned drive sprocket and the driven sprocket 29. When the crankshaft is rotated, the camshaft 14 is rotated via the cam chain 30.

[0014] Fig. 3 is a cross sectional view taken along the line III-III in Fig. 2, showing a horizontal cross section of the cylinder head of the aforementioned internal combustion engine. In the figure, a state in which an ignition plug 27 is dismounted, and the ignition plug mounting portion 31 is exposed. An arrow F indicates the front. A cooling air passage extending in the fore-and-aft direction 32 passes through the cylinder head in the fore-and-aft direction is formed along a peripheral wall 28a of the chain chamber 28 on the side of the center of the cylinder head. A space interposed between the peripheral wall 28a of the chain chamber and a peripheral wall 7a of the exhaust port is a front opening 33, a space interposed between the peripheral wall 28a of the chain chamber and a peripheral wall 9a of the intake port is a rear opening 34. In addition, a laterally extending cooling air passage 35 in communication with the aforementioned cooling air passage 32 extending in the fore-and-aft direction, passing between the peripheral wall 7a of the exhaust port and the peripheral wall 9a of the intake port, and continuing to the side of the internal combustion engine. Formed on both sides of the ignition plug mounting portion 31 is a side opening 36. As shown in the figure, the centerline A of the exhaust port 7 is inclined by an angle α with respect to the fore-and-aft direction B of the internal combustion engine toward the direction to broaden the front opening 33, so that the opening area of the front opening 33 is increased and thus a large quantity of air is introduced into the cooling air passage.

[0015] Three cooling fins are formed at the connecting portion between the cooling air passage 32 extending in the fore-and-aft direction and the laterally extending cooling air passage 35, and within the laterally extending cooling air passage 35 . They are a front fin 37, a middle fin 38, and a rear fin 39. The shadowed portions of the middle fin 38 and the rear fin 39 in the figure are thicker and higher portions having increased thickness for reinforcement, and the top portions continue to the ceiling of the cooling air passage.

[0016] Fig. 4 is a perspective view of the aforementioned cooling fins when viewed from the rear obliquely upside. The shadowed portions of the middle fin 38 and the rear fin 39 at the top thereof are cross sections of the top portions of the thicker and higher portions 38a and 39a continuing to the ceiling of the cooling air passage. In Fig. 1, a cross sectional view showing three fins

is shown in the laterally extending cooling air passage 35. In Fig. 2, the aforementioned three fins provided in the cooling air passage are shown as they are viewed from the backside of the internal combustion engine.

[0017] The construction of the air-cooled internal combustion engine of the present invention is as described above. Against wind is generated when a motorcycle is traveling having the present internal combustion engine mounted thereon, and the against wind generated by traveling flows from the front opening 33 of the cooling air passage 32 extending in the fore-and-aft direction, part of which passed through the laterally extending cooling air passage 35 and then both side of the ignition plug 27, and flown out from the side opening 36 by the guiding action of the three fins. Another part thereof passes between three fins, and flown out from the rear opening 34 of the cooling air passage 32 extending in the fore-and-aft direction.

[0018] An outer wall surface of the cylinder head facing toward the cooling air passage 32 extending in the fore-and-aft direction and the laterally extending cooling air passage 35 is cooled by against wind generated by traveling during travel of the vehicle. Especially, high temperatures in the combustion chamber 6 is conducted to the front, middle, and rear fins 37, 38, and 39 via a top outer shell 40 of the combustion chamber (Fig. 2), and cooled down by cooing air flowing in the fore-and-aft direction, and cooling air flowing in the lateral direction. By such cooling effect, the overheating of the cylinder head is prevented, and deterioration of seals around the cylinder head is prevented. Since high temperature generated at an electrode 30a of the ignition plug 30 is conducted to the outward exposed portion of the ignition plug 30, and cooled by the aforementioned cooling air flowing in the lateral direction, deterioration of the ignition plug due to overheating may be prevented, and thus the life of the ignition plug may be elongated. The ignition plug of the present invention is provided in the laterally extending cooling air passage in a slanted state, it can be dismounted easily from the side of the internal combustion engine, and thus maintenanceability is improved.

[0019] In addition, as shown in Fig. 3, since the centerline A of the exhaust port 7 is inclined with respect to the fore-and-aft direction B of the internal combustion engine by an angle of α in the direction of broadening the front opening 33, the opening area of the front opening 33 increases, and thus a large quantity of air may be introduced. Therefore, the air-cooling effect utilizing against wind generating by travel may be improved.

Claims

1. An air-cooler internal combustion engine comprising:

   a valve gear mechanism provided above a combustion chamber; and
   a cooling air passage extending in the fore-and-aft direction between said combustion chamber and said valve gear mechanism along an exhaust port and an intake port,

   characterized in that a laterally extending cooling air passage in communication with said cooling air passage extending in the fore-and-aft direction is provided between said exhaust port and the intake port, an ignition plug is provided in the laterally extending cooling air passage, and a cooling fin curved from said cooling air passage extending in the fore-and-aft direction toward said laterally extending cooling air passage is provided.

2. An air-cooled internal combustion engine according to Claim 1, **characterized in that** a centreline of said exhaust port is inclined with respect to the fore-and-aft direction of an internal combustion engine so as to broaden a front opening of said cooling air passage extending in the fore-and-aft direction.

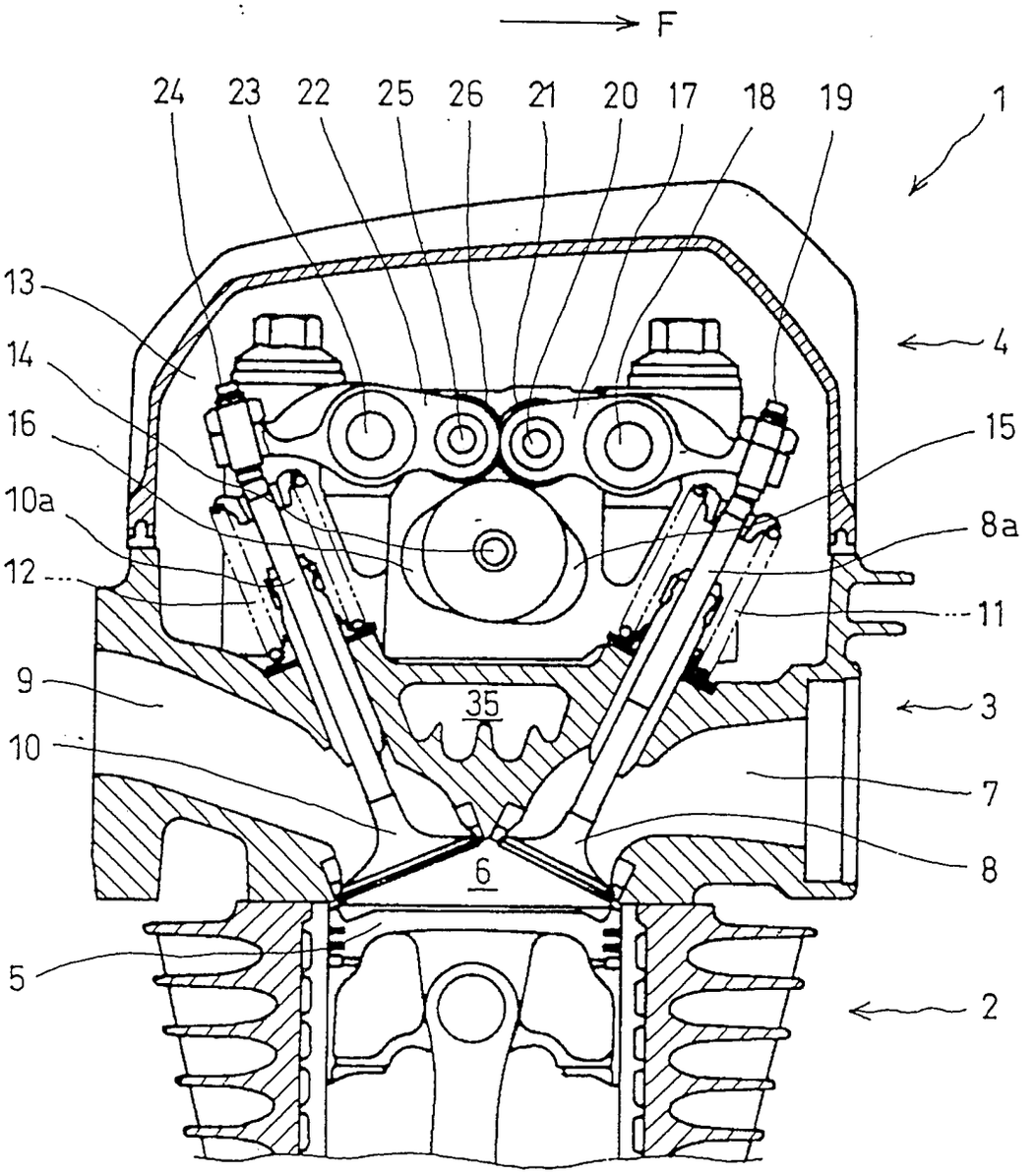
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FIG. 1

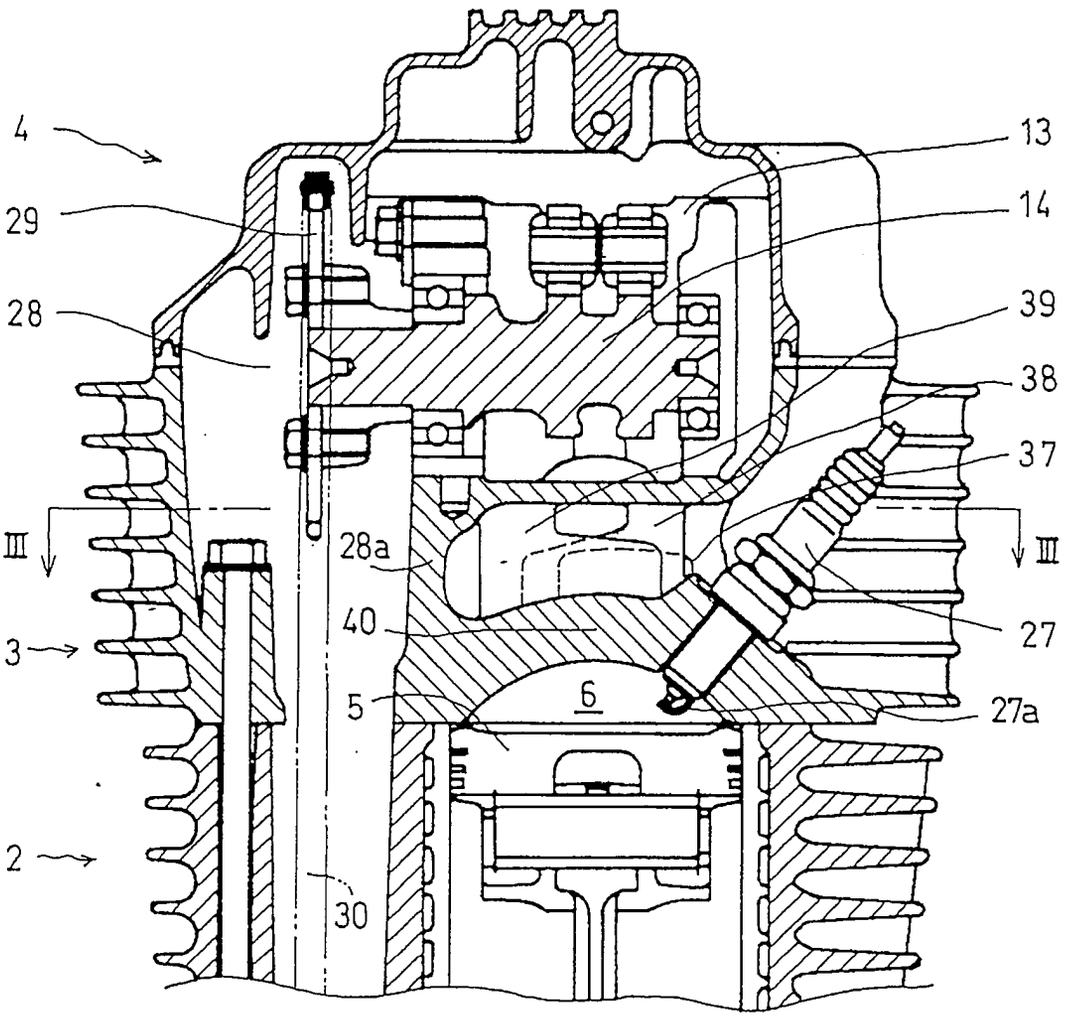

FIG. 2

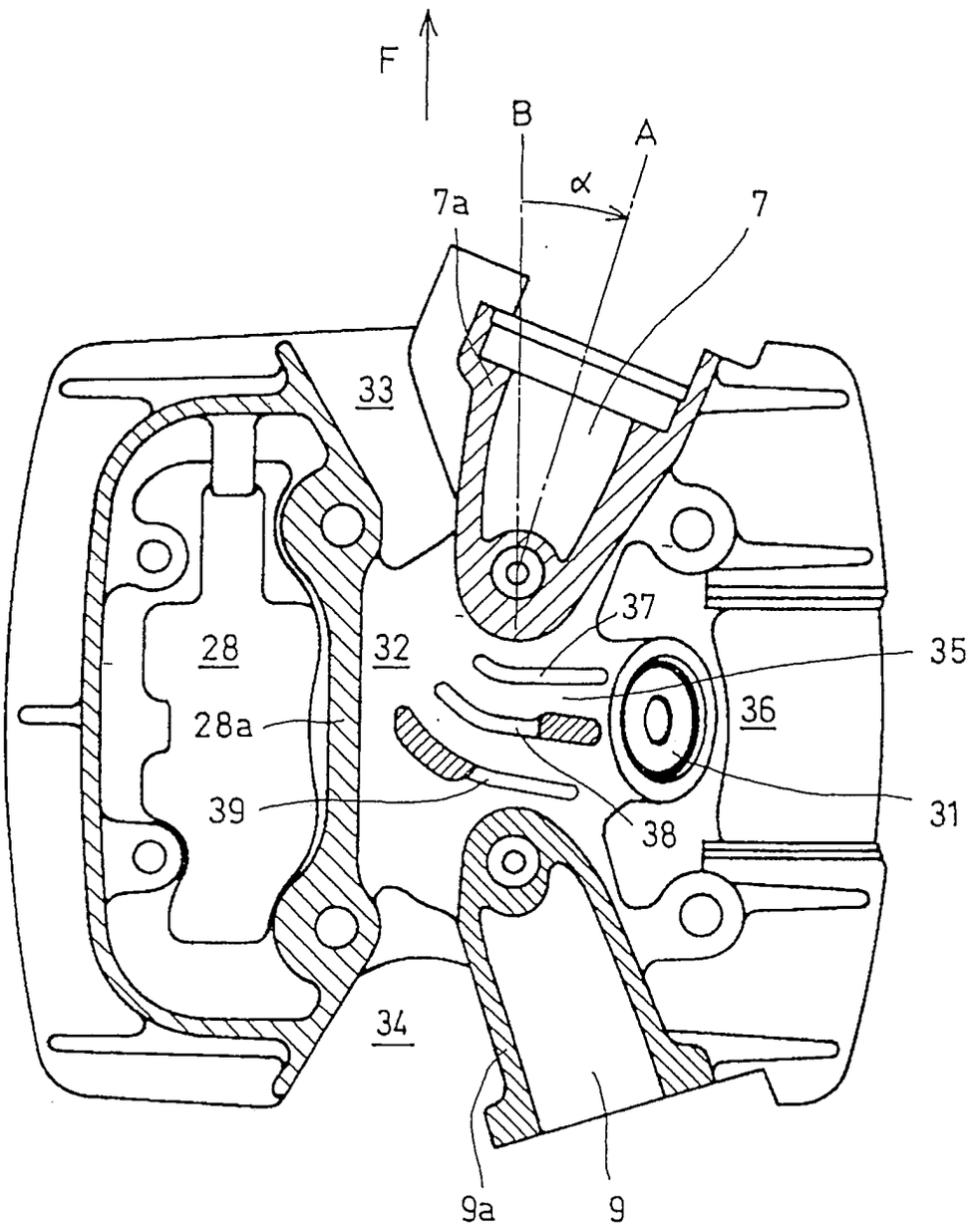

FIG. 3

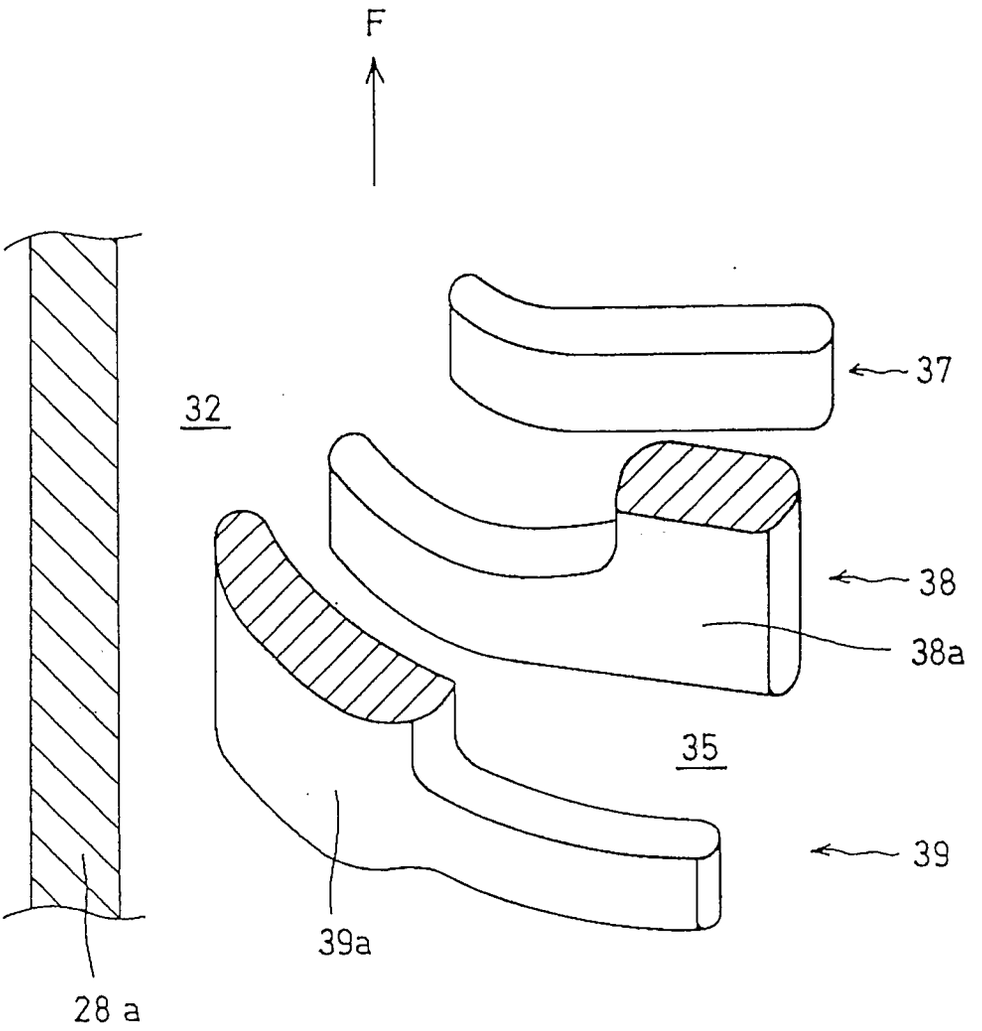

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 03 10 3501

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F02F
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 October 2003	Wassenaar, G

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